DOCUMENT RESUME

ED 395 580 IR 017 892

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TITLE Practising Argumentation through Computer Conferencing.
PUB DATE 94
NOTE 16p.; Paper presented at the International Conference on Argumentation (3rd, Amsterdam, Holland, June 21-24, 1994).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Mediated Communication; Electronic Mail; Foreign Countries; *Group Discussion; Higher Education; Introductory Courses; *Learner Controlled Instruction; *Persuasive Discourse; *Teleconferencing; Tutors; Undergraduate Students
IDENTIFIERS *University of Jyvaskyla (Finland)

ABSTRACT

In this study, computer conferencing was applied in the field of university-level social studies and education to examine: (1) the extent to which it is possible to promote students' argumentation skills through computer conferencing; and (2) whether a tutor-led seminar mode or a student-led discussion mode is a more appropriate way to practice argumentation in a computer conference. Subjects consisted of 224 students taking an introductory course in the sociology of education at the University of Jyvaskyla, Finland. Four computer conference groups with eight students in each were established: two engaged in the seminar mode and two in the discussion mode of conferencing. Two tutors were also employed. The remaining 193 students formed a comparison group and engaged in traditional self-study. Findings indicating better results among the computer conferencing students suggest that conferencing is an appropriate way to practice argumentation and promote the students' argumentation skills. In addition, the results indicating better scores among the discussion mode of computer conferencing suggest that the student-led discussion mode of conferencing is more appropriate for practicing argumentation than the tutor-led seminar mode. (Contains 32 references.) (AEF)

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ED 395 580

PRACTISING ARGUMENTATION THROUGH COMPUTER CONFERENCING

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Paper presented at the Third International Conference on Argumentation, Amsterdam, June 21-24, 1994

1 Introduction

Computer conferencing (CC) is based on electronic mail (e-mail) messages that may be sent at any time, day or night. The educational potential of CC is related to its possibilities to create learning environments suitable for self-directed and collaborative learning as well as facilitated and increased interaction (Harasim 1990). Mason (1988) characterizes CC students as people who self-directively and actively search for knowledge and who define their aims and learning demands independently. Gundry (1992) emphasizes the collaborative aspect of CC and highlights the process of learning from others, not about others, as the key characteristic of CC interaction. Harasim (1990) calls this CC interaction many-to-many interaction since several people are communicating together and the messages are exchanged between a group of people, contrary to an ordinary e-mail in which the messages are exchanged between two individuals (Eastmond 1992; Harasim 1990). This group interaction during conferencing is emphasized also by Hiltz (1990) who suggests that knowledge in a computer conference is not something that is delivered to the students, but something that occurs and develops in an active dialogue between the learners aiming at understanding and applying the concepts and issues confronted during the interaction. Positive learning effects of collaborative CC interaction have also been reported in many studies (Hiltz & Meinke 1989; Mason 1993; Marttunen 1992, 1994).

Characteristic of academic interaction is argumentation which is needed when relevant reasons are presented in order to support one's positions and standpoints. Argumentation is also used as a method in proving the validity of scientific knowledge (Cronbach 1990: 185-189). According to Perry (1981), the comprehension of the relativity

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of knowledge and the skill to form independently grounded opinions are essential components in developed scientific thinking. Consequently, practising of argumentation is an essential way when aiming at teaching the students the tools needed in scientific thinking. Finally, since engaging in interaction with other people has been found to be a successful way to practise argumentation and critical thinking (Smith 1977), and since computer conferencing provides effective means for establishing interaction (Steinberg 1992), it is appropriate to apply conferencing in the teaching of these academic skills (Clark 1992; Charlton 1993).

2 Nature of CC in terms of practising argumentation

The qualities of computer conferencing can be examined from the perspective of argumentation in many ways. *First*, computer conferencing has been characterized as a democratic medium enabling participation of all the members on an equal basis (Miller 1991). Equality, it is alleged, is promoted because the learning environment is free from some of the features typical of face-to-face settings that may inhibit the discussion, for example, gender, age, ethnicity, occupational status or performance skills. In addition, socially shy persons and those who need time to construct their ideas can, it is claimed, participate in conference discussions on a democratic basis. Equal and democratic opportunities are important aspects for argumentation when they enable the discussants to concentrate on matters of fact, not on the presenters of the facts (cf. Hiltz & Meinke 1989).

Second, studying through computer conferencing consists of text-based contributions to the topics under consideration. As Henri (1992) puts it, written text demands exactness, careful consideration, and explicit expression of thoughts. These criteria play a fundamental role in argumentative dialogues and debates because the goal of the activities is to assess the strengths and weaknesses of others' contributions. In addition, when using CC there is an opportunity to re-read one's own and other people's texts before any revisions of ideas are carried out.

Third, the asynchronous nature of CC interaction makes it possible to participate without restrictions of time and place. To have enough time is important, for example,

in a debate when a person wants to construct valid reasons in order to support his/her opinions with special care. In addition, when people can log on at any time convenient they can make use of resource materials, books, newspapers, notes etc., in preparing their contributions to discussions.

Fourth, perhaps the most unique feature of computer conferences is the possibility for group communication and many-to-many discussions (Harasim 1990). Through this kind of interaction participants may make use of the ideas and thoughts of the other conference members (Steinberg 1992). This is important in argumentative discussions in which the main purpose is to find out many relevant points of view and, thus, create alternative approaches to the issues examined.

In the present study, computer conferencing was applied in the field of university level social studies and education. Typical of these particular disciplines is that only seldom is there one correct answer to the issues confronted. Rather, many social and educational issues most often have several dimensions and many alternative approaches to analysis. This multi-dimensional nature of topics offers many alternatives for argumentation.

In the following a CC experiment, in which conferencing provided the students a learning environment appropriate for practising argumentation, is described. Two research questions were asked: 1) To what extent is it possible to promote students' argumentation skills through the use of computer conferencing? 2) Which is a more appropriate way to practise argumentation in a computer conference, a tutor-led seminar mode or a student-led discussion mode?

3 Method

3.1 Subjects and design

The subjects of the study consisted of 224 students taking an M.Ed level introductory course in the sociology of education at the Department of Education in the University of Jyväskylä, Finland, during the autumn term 1990. Four computer conferences were established: two groups engaged in the seminar mode and two groups in the discussion

mode of conferencing. Participants in the four groups, eight students in each, were recruited on a voluntary basis. Two tutors were also employed. The remaining 193 students formed a comparison group and they engaged in the traditional self-study at the same time. The students in the conference groups and in the self-study group were administered a posttest measuring the level of the argumentation skills after the computer conference. The CC studies consisted of practising argumentation and, thus, acted as an experimental treatment. The design employed can be called a quasi-experimental static-group comparison design (Borg & Gall 1989: 688-689).

Answers to the research questions were sought by comparing the posttest results between different groups. The first question was addressed by comparing the results of all the CC students with those engaged in the self-study, and question two by comparing the results of the students engaged in the seminar mode of conferencing with those engaged in the discussion mode.

3.2 Teaching arrangements

3.2.1 General aspects of the computer conference studies

The software used in organizing the computer conference was an ordinary electronic mail (Elm) for Unix including a text editor named Emacs. Elm was equipped which a mailing list containing the addresses of all the participants of the conference. Hence, the program delivered the messages sent in one group to the other students and the tutor in that particular group.

During the six week studies the students wrote texts relating to the topics addressed in the set books and lectures. Studying was interactive in nature: the students' texts consisted of their own ideas and thoughts as well as comments relating to the other students' texts. The participants were supposed to write at least two messages a week in order to pass the course and earn the credit.

The conference members did not know each other personally before the studies, and they also had the possibility to remain anonymous during the studies. Only the conference organizers knew the students' real names. A single face-to-face session was

held prior to the studies in order to get the students familiar with the use of the computer terminals and the mailing program.

The main contrast between the different modes of computer conferencing was that in the discussion mode the conference topics were selected by the students together while, in contrast, in the seminar mode by the tutor. In addition, the tutor's general role in the seminar mode resembled that of a teacher and a leader but in the discussion mode, rather, that of a co-worker and a resource person.

3.2.2 Practising argumentation in the computer conference

The didactic content of the computer conference studies was argumentation itself. Studying in the conference consisted of the students' argumentative contributions related to the topics addressed in the set books and lectures. During the conference studies the students were directed to present in their texts a lot of their own opinions and points of view related to the discussion topics as well as to critique the other students' opinions and standpoints. In addition, the students were directed to defend themselves by presenting counter-arguments when critiqued by other students.

The aim of the conference was to create a collaborative learning environment in which the students are engaged in a constructive dialogue and debate. Hence, they were offered an opportunity to make use of the peer students' opinions and alternative approaches to topics under examination. Furthermore, special attention was paid to grounding by asking the students to present carefully considered reasons in order to support all their opinions and critical comments.

3.3 Data collection

The course in question consisted of three set books and a series of lectures. The contents of two of the books (Broady 1986; Takala 1989) were related to the data collection of this study. Broady's book was obligatory to everyone while Takala's book was optional with the third one. Hence, all of the 224 students answered the tasks relating to Broady's book and a subset of 134 subjects the tasks relating to Takala's book. The end-of-course examination included tasks relating to a) subject contents, and

b) argumentation skills. Tasks related to argumentation skills constitute the data of this study. In all, argumentation skills were measured with six tasks. Two of the tasks (tasks 1 and 2) were not related to the two set books mentioned above while the other (tasks 3 through 6) were based on them.

Tasks 1 and 2 were focused on the *styles of commenting on written arguments*. This was measured by presenting the students two task arguments, both containing a position and the supporting grounds. The arguments were composed by the researcher and the students were asked to comment on them in whatever way they wanted. The task arguments were of the following kind.

> *Task 1 (a non-provocative argument):* "I think that it's useful to get an education. On the one hand, it's clear that the better one's education the easier it's for one to get a job. And on the other hand, the better educated a person is the better possibilities he/she has to begin to do that kind of work he/she really wants. And besides, highly educated people are most appreciated in society".

> *Task 2 (a provocative argument):* "My position is that a child's social background doesn't influence his status in society when he is an adult. To begin with, intelligence is inherited genetically, not on the basis of the parents' social class. Secondly, financial aid for students makes it possible for everyone to get as much education as they want. Furthermore, it's a known fact that parents' occupation doesn't influence the occupation of a child. And finally, I'd say that the educational guidance in schools gives everyone the same information of the educational possibilities in society. On the basis of the above it's possible to make the conclusion that everyone has equal possibilities to advance in society".

Task one was planned to mirror the generally approved opinions on the issue. It was supposed to be non-provocative in nature so that it would be difficult to comment on it. By contrast, task two was planned to be a provocative one which would be easier to comment on. Especially the faulty claim, faulty grounds and the faulty conclusion were assumed to act as easy stimuli to the students. For more details see Marttunen (1992).

Tasks 3 and 4 focused on the *analysis of argumentative text* (Table 1). The researcher composed the tasks by selecting two argumentative text passages, one from Broady's book (task 3) and the other from Takala's book (task 4). The students were then asked to identify from both of the texts a) the main claim (claims 1 and 2), b) the grounds that supported the claim (groundings 1 and 2), and c) to draw their own conclusion based on the groundings (conclusions 1 and 2).

Tasks 5 and 6 (Table 1) focused on the *composition of one's own arguments*. They were composed by giving the students one central theme from both Broady's book (task 5) and Takala's book (task 6). The students were then asked to compose a) their own claims relating to the themes (claims 3 and 4), and b) the grounds to support their claims (groundings 3 and 4).

3.4 Data analysis

3.4.1 Styles of commenting on written arguments

The answers to the two task arguments (tasks 1 and 2) were analyzed on two dimensions which formed four variables, two from both of the tasks. All of the variables were divided into three categories which got the numerical values of 0, 1 and 2.

Variables X1 and X3 were named *'degree of analytic approach'* and they were classified on the basis of how analytical the responses to the argument presented for comment were. An analytical answer (value 2) proceeded on the basis of the logic of the task argument and it included responses to the essential points: the structural components of the argument, i.e. the claim and the grounds.

In contrast, a general answer (value 0) proceeded on a general level. It included only a few or no responses to the components of the argument. Instead, the students had reacted to some unessential points.

The main idea of the classification was that an answer containing an analytical approach would mirror the understanding of the logic of argumentation: that an argument consists of a claim and of the supporting grounds and that these elements are the essential objects when commenting on an argument. On the basis of these criteria an analytical answer was interpreted as a relevant and a general answer as an irrelevant style of responding to an argument.

Variables X2 and X4 were named *'degree of argumentation'*. An argumentative answer (value 2) included particularly criticism and problematization of the thoughts included in the task argument. Furthermore, in an argumentative answer the student was able to suggest new questions and approaches to issues under examination. Due to the different nature of the tasks the emphasis varied in the analysis. In the case of the non-provocative argument, especially problematization of the issues played a central role and in the case of the provocative argument,

criticism towards the ideas presented. By contrast, a non-argumentative answer (value 0) was narrative or descriptive in nature and instead of criticism it included primarily repetition of the thoughts of the task argument.

An argumentative answer was interpreted to indicate understanding of the main function of argumentation: the function of grounding. The students had perceived that when commenting on an argument their most important task was a critical evaluation of thoughts presented. Correspondingly, an argumentative answer was interpreted as a relevant and a non-argumentative answer as an irrelevant style to response to an argument. For more details see Marttunen (1992).

3.4.2 Analysis of the claims, grounds and conclusions

In the analyses of the tasks 3 to 6 the toulminian approach to argumentation was utilized (Toulmin et al. 1984; Cerbin 1988). The analyses consentrated on the students' skills in formulating the claims, the grounds and the conclusions (Table 1).

Table 1
Formation of Variables Related to the Claims, Grounds and Conclusions

Book	Element of an argument and analysis criteria	Focus of the task: Analysis on argumentative text (tasks 3 and 4)		Focus of the task: Composition of one's own argument (tasks 5 and 6)	
	Claims (C)				
B[a]	Form	(C 1)	X5	(C 3)	X6
	Focus		X9		X10
	Clarity		X13		X14
	Substance		X17		
T[b]	Form	(C 2)	X7	(C 4)	X8
	Focus		X11		X12
	Clarity		X15		X16
	Substance		X18		
	Grounds (G)				
B[a]	Accuracy	(G 1)	X19	(G 3)	X20
T[b]	Accuracy	(G 2)	X21	(G 4)	X22
	Conclusions (Cl)				
B[a]	Justification	(Cl 1)	X23		
	Consistency		X25		
T[b]	Justification	(Cl 2)	X24		
	Consistency		X26		

[a]Broady's book. [b]Takala's book.

Two aggregated variables were formed on the basis of the analyses of the **claims** (Table 1). The first variable, *Clearness (S1)*, examined whether the students possessed a skill to formulate clear claims. It was formed by summing the scores of the 12 item variables relating to the four claims. The item variables focused on whether a) a claim included a contention (form variables X5 to X8), b) whether a claim focused on one contention (variables X9 to X12), and c) whether a claim was understandable (variables X13 to X16). All these item variables were dichotomous in nature and the simple matching similarity ratio (SM ratio) between them varied from .57 to .99 (*see* Anderberg 1973). The second variable, *Substance (S2)*, was formed by summing the scores of item variables X17 and X18 (SM ratio .52), which focused on whether the claims

identified by the students from the texts corresponded to the fundamental claims of the authors in the texts.

The **grounds** were analyzed by four variables (X19 to X22) named *"Accuracy"* indicating the students' skill in formulating accurate grounds (Table 1). Two of the variables were based on the grounds the students had to identify from the texts (groundings 1 and 2), and two on the grounds they were asked to compose by themselves to support their claim (groundings 3 to 4). No aggregated variables were formed since the intercorrelations of the variables were low.

When presenting accurate grounds a person had provided relevant evidence which provided a wide scope of support to the claim. By contrast, when the grounding was deemed inaccurate it included only a few and often irrelevant grounds.

The analysis of the **conclusions** (Table 1) was based on tasks 3 and 4, in which the students were asked to examine the two text passages by identifying the claim and the grounds from the texts and to draw a conclusion based on the grounds. The analysis focused on the relation of the conclusion to the grounds and to the claim.

In the analysis of the relation of the conclusions to the grounds the focus was on the justification of the conclusion (i.e., whether it was supported by the grounds). Two item variables (X23, X24), based on conclusions 1 and 2, were formed (SM ratio .66). Their scores were aggregated to form a new variable, *Justification (S3)*, which describes the students' skill in drawing justified conclusions.

When the focus of the analysis was on the relation of the conclusion to the claim the consistency of an argument was examined. The argument consisted of the claim, the grounds and the conclusion the students had composed. Since a claim consists of a conclusion (Voss *et al* 1986) an argument in which the conclusion was identical or parallel to the claim was interpreted as consistent, and an argument in which the claim and conclusion differed from each other, as inconsistent. Item variables X25 and X26 (Pearson Product Moment Correlation .31, p=.000) were aggregated to form a new variable, *Consistency (S4)*. It indicated whether the students possessed the skill to compose conclusions manifesting the consistency of an argument. The details of the analyses are described in Marttunen (in press).

4 Results and conclusions

The results are presented in Table 2 which presents the means of all the variables. The results are compared, on the one hand, between the students engaged in different modes of study, and on the other hand, between the students engaged in different modes of computer conferencing (CC).

Table 2
Students' Argumentation Skills in Different Modes of Study and Modes of CC

	Mode of study					Mode of CC				
Variable	CC-study		Self-study			Seminar		Discussion		
	N	M	N	M	p	N	M	N	M	p
A non-provocative argument										
Degr. of anal. appr. (X1)	31	**0.55**	191	0.37	*	15	0.47	16	**0.63**	n.s.
Degr. of argument. (X2)	31	**0.53**	191	0.39	n.s.	15	0.40	16	**0.66**	n.s.
A provocative argument										
Degr. of anal. appr. (X3)	31	**0.36**	191	0.33	n.s.	15	0.27	16	**0.44**	n.s.
Degr. of argument. (X4)	31	**0.47**	191	0.38	n.s.	15	**0.50**	15	0.44	n.s.
Claims										
Clearness S1[a]	31	**0.91**	102	0.89	n.s.	15	0.91	16	0.91	n.s.
Substance S2[a]	30	0.60	97	**0.65**	n.s.	14	0.46	16	**0.72**	*
Grounds										
BAnal Accuracy X19[b]	30	**0.49**	190	0.33	*	14	0.43	16	**0.53**	n.s.
BComp Accuracy X20[c]	28	**0.34**	183	0.24	n.s.	13	0.27	15	**0.40**	n.s.
TAnal Accuracy X21[d]	31	0.29	96	**0.34**	n.s.	15	0.27	16	**0.32**	n.s.
TComp Accuracy X22[e]	30	0.34	102	**0.52**	*	14	0.29	16	**0.38**	n.s.
Conclusions										
Justification S3[a]	31	**0.32**	96	0.30	n.s.	15	0.27	16	**0.38**	n.s.
Consistency S4[a]	30	**0.43**	91	0.21	**	14	0.32	16	**0.52**	n.s.

Note. Range of all variables is from 0 to 1.
[a]An aggregated variable.
[b]Variable related to the analysis of an argumentative text passage in Broady's book.
[c]Variable related to the composition of one's own argument based on a theme in Broady's book.
[d]Variable related to the analysis of an argumentative text passage in Takala's book.
[e]Variable related to the composition of one's own argument based on a theme in Takala's book.
* $p < .05$
** $p < .01$

The results showed higher means among the students engaged in the CC study compared to those engaged in the self-study in the case of 9 variables out of the total of 12 variables

measuring argumentation skills. In the case of 3 variables (X1, X19, S4) the difference was also statistically significant. The self-study group achieved higher scores in the remaining 3 variables from which one variable (X22) indicated a statistically significant difference.

When the results of the different modes of CC were compared the students engaged in the discussion mode of conferencing achieved higher means in all but one of the total of the 12 variables. In the case of one variable (S2) the difference was also statistically significant.

The findings indicating better results among the CC students suggest that conferencing is an appropriate way to practise argumentation and promote the students' argumentation skills. This inference is supported by the recent results suggesting the general suitability of computer software for practising argumentation (Bacig *et al.* 1990) as well as by the positive experiences from CC in practising argumentation and critical thinking (Clark, 1992; Charlton, 1993). There are, however, limitations related to the design of the study that have to be taken into account when examining the results. *First*, the CC students were recruited on voluntary basis, and hence, the design lacks the randomization of the subjects. One threat of this shortage is that the differences between the groups may be attributed to characteristics of the groups as well as to the experimental treatment (Borg & Gall 1989: 689). Another shortage is that the students in the CC-groups may have been more motivated for debating and exchanging opinions than their counterparts in the self-study group, and thus, more skilled in argumentation already before the experiment. *Second*, it is worth questioning whether it is possible to develop any cognitive skills during the short time of six weeks, especially because it has been claimed (Pascarella 1989) that rather than any particular experience, it is the students' engagement in the intellectual and social experience of college that promotes this kind of skills. Nevertheless, since many short CMC interventions (Clark 1992; Harrison & Stephen 1992; Steinberg 1992; Charlton 1993) have proved feasible when practising argumentation it is legitimate to assume that there was some progress in the students' argumentation skills due to the experiment, although a longer CC period would have been more appropriate in this respect.

In addition, the results indicating almost consistently better scores among the discussion mode of CC suggest that the student-led discussion mode of conferencing is a more appropriate way for practising argumentation compared to the tutor-led seminar mode. The results are accordant also with previous studies reporting on CC's applicability for student-led discussions and self-directed learning (Mason 1988; Harasim 1989). However, the differences were again small, and hence, one has to adopt a qualified attitude towards the inference. Nevertheless, the results of

the students engaged in the more self-directive and autonomous mode of conferencing reveal that the students are able to carry the responsibility for their own studies if the possibility for this is offered to them.

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